# Public Health Assessment for





PETITIONED PUBLIC HEALTH ASSESSMENT

AMERICAN CHEMICAL SERVICES, INC.

GRIFFITH, LAKE COUNTY, INDIANA

CERCLIS NO. IND016360265

MARCH 12, 1992

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES**
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

Comments Period Ends:

# THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104 (i) (7) (A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risks assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, this Health Assessment has been conducted using available data. Additional Health Assessments may be conducted for this site as more information becomes available.

The conclusions and recommendations presented in this Health Assessment are the result of site specific analyses and are not to be cited or quoted for other evaluations or Health Assessments.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

MAR 2-3 19

Waste Management Division
United States Environmental
Protection Agency
77 W. Jackson Blvd. (H-7J)
Chicago, Illinois 60604

Wayde Hartwick

Dear Sirs:

We are submitting the following draft Preliminary Health Assessment for your review:

American Chemical Service

Please review this document for any major technical or factual errors or omissions. Should you have any comments, please submit them to us, in writing, for review and transmittal to the appropriate state health department representative. We also ask that you send a copy of this document to your state environmental agency.

Please return the review comments back to ATSDR within 30 days. Should you have problems meeting this schedule, please let us know that there will be a delay.

If you have any concerns, please feel free to call us at 886-0840. We look forward to making this Preliminary Health Assessment a helpful and useful document.

Sincerely,

L. Fabinski

Louise Fabinski
Regional Representative

cc: Max Howie DHAC/RIMB

# Petitioned Public Health Assessment

AMERICAN CHEMICAL SERVICES, INC.

GRIFFITH, LAKE COUNTY, INDIANA

CERCLIS NO. IND016360265

## SUMMARY

Extensive on-site subsurface soil and groundwater contamination has been found at the American Chemical Services National Priorities List (NPL) site, Griffith, Indiana. The groundwater contamination has migrated off site, but has not infiltrated the local residential wells. One unused industrial supply well was found to contain lead at levels of public health concern. It is unlikely that this lead contamination is related to the American Chemical Services NPL site because lead was not detected in groundwater at or near the NPL site and analyses of a sample from an upgradient-private well just south of the contaminated industrial supply well did not find lead.

On the basis of the available information, the Agency for Toxic Substances and Disease Registry (ATSDR) concludes that the American Chemical Services NPL site is a public health hazard because existing groundwater contamination may migrate into local residential wells. In addition, ATSDR concludes that additional surface soil sampling (0-3 inches) should be conducted at the Kapica/Pazmey area. This sampling is needed to better characterize the extent of surface soil contamination. The extent of environmental contamination at the Griffith Municipal Landfill has not been totally characterized. Soil gas analysis should be conducted to evaluate the extent of landfill gas generation and migration. Although there is no documentation indicating human exposure to site-related contaminants, there are community health concerns which should be addressed. Therefore, ATSDR will provide community health education during meetings with the petitioners and the general public.

## BACKGROUND

### A. SITE DESCRIPTION AND HISTORY

The American Chemical Services (ACS) National Priorities List (NPL) site is located in Griffith, Indiana (See Appendix A Figure I). Although the site is named after ACS Inc., the U.S. Environmental Protection Agency (EPA) has specified that the NPL site includes the ACS Inc. property (19 acres), the Pazmey Corporation property (2 acres; a.k.a. Kapica Drum Incorporated), and the inactive portion of the Griffith Municipal Landfill (15 acres) (1).

Six areas of probable waste disposal have been identified at the NPL site. These six areas have been assigned the following designations by EPA and ACS Inc. management: the On-Site Containment area, the Still Bottoms area, the Treatment Lagoon #1, the Off-Site Containment area, the Kapica/Pazmey area, and the Griffith Municipal Landfill (see Appendix A Figure II) (1).

An active solvent recovery and chemical manufacturing facility is located on the ACS Inc. property. The ACS Inc. enterprise is permitted to continue operations under a Resource Conservation and Recovery Act (RCRA) Part B Interim Status. ACS Inc. began operations as a solvent recovery facility in May 1955. The manufacturing of small batches of specialty chemicals was first begun in the late 1960's and early 1970's. The solvent recovery and the production of specialty chemicals have continued up to the present. ACS Inc. may not be permitted to continue operations if the RCRA permit is not finalized.

Disposal of waste generated from ACS Inc. operations occurred at various locations at the ACS Inc. property (On-Site Containment area, Still Bottoms area, Treatment Lagoon #1, and Off-Site Containment area). Still bottoms (material leftover after the usable solvent has been reclaimed) from the solvent recovery process were originally disposed of in the Still Bottoms Pond and Treatment Lagoon #1 (1955-1972). A portion of Treatment Lagoon #1 may have been incorporated into the present-day fire pond when it was constructed in November 1973.

Between 1958 and 1975, the Off-Site Containment area was utilized as a waste disposal area. A variety of wastes were disposed of in the Off-Site Containment area including: still bottoms from the Still Bottoms Pond and Treatment Lagoon #1, ash from the two incinerators which operated from 1966 through 1970, general refuse, an estimated 20,000 to 30,000 drums, and a tank truck partially full of solidified paint. It is reported that the drums were punctured prior to disposal (1).

During the mid-1960s, approximately 400 drums containing sludge and semi-solids of unknown types were reportedly disposed of in

the On-Site Containment area (1).

At the present time, still bottoms from the ACS Inc.'s solvent reclamation operations are disposed of off-site in appropriately permitted facilities. Waste solvents are either disposed of off-site at RCRA permitted facilities or in ACS Inc.'s secondary fuel blending program. Waste water originating from the solvent reclamation, small batch and epoxidation operations, as well as non-contact cooling water and water from boiler blowdown operations is routed to the City of Griffith sewer system (1).

The Griffith Municipal Landfill has been in operation since the 1950's. Prior to the implementation of RCRA, wastes from ACS Inc. and Kapica Drum Inc. were reportedly disposed of at the landfill. Currently, the landfill accepts solid waste (1).

Kapica Drum, Inc. was in operation from 1951 through 1987. Operations consisted of drum reconditioning. Rinse water from drums containing hazardous wastes was reportedly disposed of on the property, as were liquids from the drums to be reconditioned. Liquid waste from the drum washing operations reportedly flowed onto ACS Inc. property intermittently between 1962 and 1983. Kapica Drum, Inc. was sold to Pazmey Corporation in February 1980. The Pazmey Corporation sold the property to a private individual in March 1987. The property is presently being used to store boats and cars (1).

The site was added to the NPL, "Superfund," in August 1984. The Remedial Investigation (RI) of the ACS NPL site is being conducted by the ACS Principal Responsible Parties. Warzyn Engineering Inc. is the consultant for the ACS Principal Responsible Parties. The RI environmental sampling was conducted from July 1989 through August 1990. A draft RI report was submitted by the ACS Principal Responsible Parties to EPA in November 1990 (1). Additional sampling was conducted in January 1991 and August 1991.

In June 1989, the Agency for Toxic Substances and Disease Registry (ATSDR) was petitioned by local citizens to evaluate the public health concerns associated with the ACS NPL site. ATSDR accepted the petition in January 1990. This public health assessment is being conducted to address the concerns of the petitioners. In addition to responding to the petition, the ATSDR is required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, to conduct a Public health assessment for every site proposed for the NPL. In November 1988 ATSDR conducted a preliminary public health assessment on the ACS NPL site.

**B. SITE VISIT**

Mr. Sven E. Rodenbeck and Ms. Louise Fabinski from ATSDR

conducted a site visit on April 25-27, 1990. During the site visit, ATSDR staff met with representatives of the Indiana State Board of Health, the Lake County Health Department, Warzyn Engineering Inc., and EPA. In addition, the ATSDR staff met with the citizens that petitioned the agency in June 1989.

While at the ACS NPL site, ATSDR staff scrutinized the areas of contamination. Information on the number and location of residential wells was obtained from Warzyn Engineering Inc. and the Lake County Health Department.

Both the ACS Inc. area and the Griffith Municipal Landfill are fenced. The other portions of the NPL site have been fenced since the RI began.

**C. DEMOGRAPHICS, LAND USE, AND NATURAL RESOURCE USE**

The ACS NPL site is located within the corporate boundary of the City of Griffith. Approximately 50 individuals are employed at ACS Inc. The area surrounding the site is primarily industrial with three major railroads intersecting northwest of the NPL site. The nearest residents are located across Colfax Avenue, approximately 200 feet east of the NPL site boundaries.

A residential well survey conducted by Warzyn Engineering Inc. indicates there are 16 wells within half mile radius of the ACS NPL site (see Appendix A Figure III) (1). It is estimated that 40 individuals (men, women, and children) rely on the 16 wells for potable water (drinking and cleaning). Most Griffith residents obtain potable water from the municipal system. The municipal system derives its water from Lake Michigan.

According to the 1990 U.S. Census (Tract Numbers 409 and 410), the City of Griffith has a population of 17,916 (94.7% white, 2.4% black, and 2.9% other). The population of Griffith increased approximately five percent since the 1980 U.S. Census. The percentage of the population over age 18 was around 75% (70.8% white, 2.0% black, and 2.2% other). The 1990 U.S. Census indicates there are 6,914 housing units within the City of Griffith.

The ACS NPL site is surrounded by marsh areas towards the north, west, and southwest. No hunting or fishing is conducted on site or in the surrounding marshes.

**D. HEALTH OUTCOME DATA**

The State of Indiana Board of Health provided information from their Cancer Registry for the population in Griffith and within the State (Cancer Incidence for 1987-89 and Cancer Mortality Rates for 1970-79). In addition, ATSDR reviewed 1950 to 1979 cancer mortality data on Lake County and the State of Indiana

contained in the Riggans Cancer Mortality database. The Riggans database is maintained on the Centers for Disease Control computer mainframe.

## COMMUNITY HEALTH CONCERNS

During the April 1990 site visit, ATSDR talked with the individuals who petitioned the Agency about their health concerns related to ACS NPL site. The petitioners believe there is a high frequency of cancer occurring within an 8-block area north of the ACS NPL site. The cancers reported are bladder, breast, brain, uterus, lung, and leukemia.

In addition to the ACS NPL site, the petitioners informed ATSDR about an oil and solvent discharge from the Griffith Airport. Because the residents near the Griffith Airport previously relied on wells for potable water (all the residents near the airport were connected to the municipal water system in the fall of 1989), the petitioners are concerned that the oil and solvent discharge from the Griffith Airport may have resulted in additional exposures to hazardous substances in addition to those from the NPL site. The petitioners urged ATSDR to arrange for sampling of their residential wells.

## ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The tables in this section list the contaminants of concern. We evaluate these contaminants in the subsequent sections of the public health assessment and determine whether human exposure to these contaminants is of public health concern. ATSDR selects and discusses these contaminants based upon the following factors:

1. Concentrations of contaminants on and off the site.

2. Field data quality, laboratory data quality, and sample design.

3. Comparison of on-site and off-site concentrations with public health assessment comparison values for noncarcinogenic endpoints and carcinogenic endpoints.

4. Comparison of on-site and off-site concentrations with background concentrations, if available.

5. Community health concerns.

The data tables that follow under the On-site Contamination subsection and the Off-site Contamination subsection list contaminants of concern. Human exposure to contaminants listed may not necessarily result in adverse health effects. Instead, the list indicates which contaminants will be evaluated further

in the public health assessment.

Comparison values for the public health assessment are contaminant concentrations in specific media that are used to select contaminants for further evaluation. These values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), and other relevant guidelines. CREGs are estimated contaminant concentrations which are based on a one excess cancer in a million persons exposed over a lifetime. CREGs are calculated from EPA's cancer slope factors. EPA's Proposed Maximum Contaminant Levels (PMCLs) are Maximum Contaminant Levels (MCLs) that are being proposed for adoption by EPA. The MCL represents contaminant concentrations that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of 2 liters water per day. The MCLs are regulatory concentrations. EPA's Reference Doses (RfDs) are estimates of the daily exposure to contaminants that are unlikely to cause adverse health effects.

## A. ON-SITE CONTAMINATION

The contaminants of concern in each media at the ACS NPL site are listed in Tables 1 - 4. All analytical results in this subsection were collected by Warzyn Engineering Inc. during the RI process from July 1989 through August 1990 (1) and during additional sampling in January 1991 and August 1991.

### Waste Material and Subsurface Soil

Organic chemical (e.g., trichloroethene and benzene) contamination was found in the waste material and subsurface soil (greater than one foot) samples at similar levels at the On-Site Containment, Still Bottoms, Treatment Lagoon #1, Fire Pond, and Off-Site Containment areas (Table 1). Except for polychlorinated biphenyls (PCBs), much lower organic chemical contamination was found at the Kapica/Pazmey area. The maximum concentration of PCBs were detected in waste material. The Off-site Containment area contained the highest concentration of PCBs in soil. The Kapica/Pazmey area soil contained concentrations of PCBs ranging from 0 to 27 mg/Kg at depths of 0 to 1 foot and from 0 to 42 mg/Kg at depths of 3 to 4.5 feet. The highest concentration of metals (lead, barium, and cadmium) in the soil was found at the Kapica/Pazmey area. Subsurface soil samples collected at depths of 3 feet in the Kapica/Pazmey area contained concentrations of lead ranging from 5,810 to 10,700 mg/Kg. The next highest levels of metal soil contamination were found at the Still Bottom area (1). No waste material or subsurface soil samples were taken at the Griffith Municipal Landfill (1).

## Table 1

### Range of Contaminant Concentration in On-Site Waste Material and Subsurface Soil

| Contaminant | Concentration Range (mg/Kg) | Comparison Value (mg/kg) | Source |
|---|---|---|---|
| **Waste Material** | | | |
| Trichloroethene | <0.005-1,700 | 1 | RfD |
| Benzene | <0.005-7,100 | 2 | CREG |
| Tetrachloroethene | <0.005-5,900 | 500 | RfD |
| Xylene (Total) | <0.005-25,000 | 100,000 | RfD |
| Carbon Tetrachloride | <0.005-3,600 | 35 | RfD |
| 1,1,2-Trichloroethane | <0.005-320 | 12 | CREG |
| Naphthalene | <0.33-2,400 | 200 | RfD |
| 1,1,1-Trichloroethane | <0.005-20,000 | 4,500 | RfD |
| Toluene | <0.005-200,000 | 10,000 | RfD |
| Polychlorinated biphenyls (PCB) | <0.08-400 | 0.09 | CREG |
| Lead | <0.005-16,200 | * | |
| Barium | <42-1,560 | 3,500 | RfD |
| **Subsurface Soil** | | | |
| Tetrachloroethene | <0.005-46,000 | 500 | RfD |
| Trichloroethene | <0.005-19,000 | 1 | RfD |
| Benzene | <0.005-46,000 | 2 | CREG |
| Chloroform | <0.005-2,800 | 20 | EMEG |
| Methyl Isobutyl Ketone | <0.01-2,500 | 2,500 | RfD |
| Vinyl Chloride | <0.01-160 | 2 | EMEG |
| 1,1,1-Trichloroethane | <0.005-150,000 | 4,500 | RfD |
| 1,1,2-Trichloroethane | <0.005-400 | 12 | CREG |
| Xylene (Total) | <0.005-100,000 | 100,000 | RfD |
| Methyl Ethyl Ketone | <0.01-99,000 | 2,500 | RfD |
| PCB | <0.08-250 | 0.09 | CREG |
| Lead | <0.005-17,200 | * | |
| Barium | <42-1,780 | 3,500 | RfD |
| Cadmium | <0.1-1,700 | 1 | EMEG |

NOTE:

mg/kg - milligram per kilogram (ppm - part per million)
CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
RfD - Reference Dose
* - No Comparison Value

Source: Warzyn Engineering, Inc. Draft Remedial Investigation Report, ACS NPL Site, Griffith, Indiana. Chicago, Illinois: Warzyn Engineering, Inc., 1990.

**Surface Soil**

Surface soil (0-3 inches) samples were not collected during the RI process. All of the waste material at the On-Site Containment, Still Bottoms, Treatment Lagoon #1, Fire Pond, and Off-Site Containment areas are covered with several feet of clean soil (1). Therefore, it is not necessary to sample surface soils at these locations. However, waste liquids and rinse water from drums were discarded directly onto the Kapica/Pazmey surface soils. Surface soil samples from this area would have been useful to determine PCB and metal concentrations in the top soil. This type of data is needed because humans are more likely to come in contact with surface soils rather than subsurface soils.

**Leachate**

The leachate samples were taken at the Griffith Municipal Landfill. Analytical results of these samples found elevated levels of organic chemicals and metals originating from the landfill (Table 2) (1).

**Table 2**

**Range of Contaminant Concentration in On-Site Leachate**

| Contaminant | Concentration Range (mg/L) | Comparison Value (mg/L) | Source |
|---|---|---|---|
| Benzene | <0.005-0.006 | 0.001 | CREG |
| Methyl Ethyl Ketone | <0.005-0.83 | 2 | RfD |
| Barium | <0.005-2.37 | 0.7 | RfD |
| Lead | <0.005-1.37 | 0.005 | PMCL |
| Manganese | <0.005-9.3 | 1 | RfD |
| Chromium (Total) | <0.005-0.288 | 0.05 | EMEG |
| Mercury | <0.0002-0.00098 | 0.003 | RfD |

NOTE:

mg/L - milligram per liter (ppm - part per million)
CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
RfD - Reference Dose
PMCL - Proposed Maximum Contaminant Level

Source: Warzyn Engineering, Inc. Draft Remedial Investigation Report, ACS NPL Site, Griffith, Indiana. Chicago, Illinois: Warzyn Engineering, Inc., 1990.

**Surface Water and Sediment**

Surface water and sediment samples were taken in the marshlands surrounding the ACS NPL site. Analytical results of these samples found benzene and lead on site above the comparison values (Table 3). Benzene and lead were not detected at levels above the comparison values beyond the boundaries of the NPL site (1).

**Table 3**

**Range of Contaminant Concentration in On-site Surface Water and Sediment**

| Contaminant | Concentration Range (mg/L) | Comparison Value (mg/L) | Source |
|---|---|---|---|
| **Surface Water** | | | |
| Benzene | <0.005-0.46 | 0.001 | CREG |
| Lead | <0.005-0.0238 | 0.005 | PMCL |
| **Sediment** | (mg/kg) | (mg/kg) | |
| Benzene | <0.005-14 | 0.001 | CREG |
| Lead | <20-702 | * | |

NOTE:

mg/L - milligram per liter (ppm - part per million)
CREG - Cancer Risk Evaluation Guide
PMCL - Proposed Maximum Contaminant Level
* - No Comparison Value

Source: Warzyn Engineering, Inc. Draft Remedial Investigation Report, ACS NPL Site, Griffith, Indiana. Chicago, Illinois: Warzyn Engineering, Inc., 1990.

**Groundwater**

Extensive groundwater monitoring (three rounds) has been conducted by Warzyn Engineering Inc. at the ACS NPL site (1). Analytical results of the groundwater samples indicate that many of the organic chemical and metal soil contaminants have migrated into the upper water table aquifer (Table 4). No contamination above the comparison values was found in the lower aquifer.

**Table 4**

**Range of Contaminant Concentration In On-Site Groundwater**

| Contaminant | Concentration Range (mg/L) | Comparison Value (mg/L) | Source |
|---|---|---|---|
| Benzene | <0.005-100 | 0.001 | CREG |
| Toluene | <0.005-2.3 | 2 | RfD |
| Ethylbenzene | <0.01-1.1 | 1 | RfD |
| Xylene (Total) | <0.005-3.0 | 20 | RfD |
| PCB | <0.001-0.0026 | 0.000005 | CREG |
| Chloroethane | <0.005-2.0 | 0.5 | Rfd |
| Vinyl Chloride | <0.01-0.72 | 0.00002 | CREG |
| 1,1-Dichloroethane | <0.01-2.4 | 1 | RfD |
| 1,2-Dichloroethane (Total) | <0.01-0.4 | 0.0004 | CREG |
| Methyl Ethyl Ketone | <0.01-220 | 2 | RfD |
| Methyl Isobutyl Ketone | <0.01-54 | 2 | RfD |
| 2-Hexanone | <0.01-1.8 | 0.3 | RfD |
| Arsenic | <0.005-0.03 | 0.01 | EMEG |
| Barium | <0.005-1.8 | 0.7 | RfD |
| Manganese | <0.005-4.2 | 1 | RfD |

NOTE:

mg/L - milligram per liter (ppm - part per million)
CREG - Cancer Risk Evaluation Guide
EMEG - Environmental Media Evaluation Guide
RfD - Reference Dose

Source: Warzyn Engineering, Inc. Draft Remedial Investigation Report, ACS NPL Site, Griffith, Indiana. Chicago, Illinois: Warzyn Engineering, Inc., 1990.

**Air**

No air samples were collected during the RI.

As discussed above in the Site Description and History section, ACS Inc. is presently operational. The major operations at ACS Inc. are solvent recovery and chemical manufacturing. These operations may result in the release of the same chemicals to the environment as are found at the NPL site. In order to identify whether ACS Inc. is discharging any additional amounts of NPL site-related chemicals to the environment, ATSDR searched the 1987 and 1988 Toxic Chemical Release Inventory (TRI). TRI is developed by EPA from the chemical release (air, water, and soil) information provided by certain industries. The TRI indicates that ACS Inc. does discharge six chemicals to the air which are of a concern at

the NPL site (1,1,1-trichloroethane, xylene (total), trichloroethene, tetrachloroethene, methyl ethyl ketone, and toluene). The highest air discharges were reported in 1988 (1,1,1-trichloroethane 452 pounds per year (lbs/yr), xylene (total) 3,671 lbs/yr, trichloroethene 302 lbs/yr, tetrachloroethene 72 lbs/yr, methyl ethyl ketone 5,765 lbs/yr, and toluene 6,190 lbs/yr). All of these reported levels of discharged chemicals are estimated. Therefore, a comparison of the analytical levels for the contaminants found at the NPL site and the ACS Inc. air discharges can not be made.

## B. OFF-SITE CONTAMINATION

### Groundwater

Off-site migration of contaminated groundwater has been confirmed by the Warzyn Engineering Inc. investigation. Groundwater samples were collected from off-site monitoring wells and off-site private wells drawing groundwater from the upper and lower aquifers. Table 5 lists the contaminants of concern found in the off-site groundwater. Warzyn Engineering Inc. collected all environmental data presented in this subsection during the RI process from July 1989 through August 1990 (1).

The highest groundwater contamination was found in off-site monitoring wells near the ACS NPL site (see Appendix A Figure IV) (1). Groundwater from off-site private wells did not contain any site related contaminants. One private well was found to contain lead (0.0417 mg/L) above the comparison value of 0.005 mg/L. This private well is an unused industrial supply well located north of the ACS NPL site (sample number PW-07, see Appendix A Figure III) (1).

In addition to determining what ACS Inc. is discharging to the environment, TRI was searched to determine whether any other industry in Griffith is discharging site-related contaminants. The TRI did not contain any other information on similar toxic chemical releases in the Griffith area.

**Table 5**

**Range of Contamination Concentration in Off-Site Monitoring Wells and Private Industrial Supply Well**

| Contaminant | Concentration Range (mg/L) | Comparison Value (mg/L) | Source |
|---|---|---|---|
| **Monitoring Wells** | | | |
| Benzene | <0.005-0.012 | 0.001 | CREG |
| Trichloroethene | <0.005-0.045 | 0.003 | CREG |
| Tetrachloroethene | <0.005-0.20 | 0.0007 | CREG |
| PCB | <0.0001-0.027 | 0.000005 | CREG |
| **Industrial Supply Well** | | | |
| Lead | <0.003-0.0417 | 0.005 | PMCL |

NOTE:

mg/L - milligram per liter (ppm - part per million)
CREG - Cancer Risk Evaluation Guide
PMCL - Proposed Maximum Contaminant Level

Source: Warzyn Engineering, Inc. Draft Remedial Investigation Report, ACS NPL Site, Griffith, Indiana. Chicago, Illinois: Warzyn Engineering, Inc., 1990.

## C. QUALITY ASSURANCE AND QUALITY CONTROL

ATSDR was provided with quality assurance and quality control (QA/QC) information concerning analytical data for the RI. The information indicates appropriate QA/QC was performed for the samples collected by Warzyn Engineering Inc. The conclusions presented in this public health assessment are based in part on the data presented in the RI report. The validity of these conclusions is therefore dependent on the accuracy and reliability of the data provided.

## D. PHYSICAL AND OTHER HAZARDS

No physical or other hazards were noted during the ATSDR site visit, except those normally found at an industrial area.

## PATHWAYS ANALYSES

### A. ENVIRONMENTAL PATHWAYS (Fate and Transport)

There are several environmental pathways through which contaminants of concern can migrate. The two primary environmental pathways are groundwater and surface water. To better understand the groundwater and surface-water pathways, the regional hydrogeological conditions are explained . All of the possible environmental pathways will then be discussed.

**Regional Hydrogeological Conditions**

The ACS NPL site is located on the lake bed of an ancient glacial lake, Lake Chicago. The landscape is generally low-lying, and predominantly the result of continental glacial processes and the processes associated with the formation of glacial Lake Chicago and the present-day Lake Michigan. The glacial processes deposited varying layers of sand, gravel, and clay on top of the regional bedrock. The glacial deposits in the immediate site vicinity are approximately 130 feet thick.

The glacial deposits near the ACS NPL site can be divided into three units: an upper sand and gravel unit, an intermediate silty clay unit, and a lower sand and gravel unit. Groundwater is found in both the upper and lower sand and gravel units. The intermediate silty clay unit acts as a dividing layer between the two groundwater aquifers. This dividing layer, called an aquitard, inhibits the flow of groundwater between the two groundwater aquifers. A graphic depiction of the glacial deposit structure at the ACS NPL site is presented in Appendix A Figure V.

Groundwater flow within the upper sand and gravel aquifer follows the contours of the local topography and is influenced by the activities at the Griffith Municipal Landfill. Because the ACS NPL site is located on top of a hill, groundwater within the upper aquifer tends to flow in a radial fashion, in all directions. Groundwater from the upper aquifer discharges to the local marshes and ditches surrounding the NPL site towards the north, northeast, west, and southwest. Groundwater flow towards the south and east has not been completely evaluated but it appears that Turkey Creek may be a discharge point for the groundwater in that direction. This aquifer is the source of potable water for a few residences (see Appendix A Figure III).

The lower sand and gravel aquifer is used more extensively as a source of potable water. The groundwater within this aquifer flows towards the north and eventually discharges into Lake Michigan.

Surface water runoff at the ACS NPL site is towards the west and south into the local marshes. These marshes drain into Turkey Creek.

**Groundwater Pathway**

In the past, waste material from ACS Inc. and Kapica Drum, Inc. operations were disposed of on site. Most of the waste material from ACS Inc. was buried on site (On-Site Containment area, Still Bottoms area, Treatment Lagoon #1, and Off-Site Containment area). Liquid waste from Kapica Drum, Inc. was discharged onto the ground. Some waste material from ACS Inc. and Kapica Drum, Inc. may have been sent to the Griffith Municipal Landfill. Since the waste material was discarded, various toxic substances in the waste material have migrated through the soil into the groundwater (Tables 4, and 5). The groundwater monitoring data indicate contamination above comparison values is restricted to the upper sand and gravel aquifer. Groundwater contamination in this aquifer is moving in the direction of groundwater flow, but has not migrated very far off site (see Appendix A Figure IV). Analytical results of samples taken from local residential wells did not find any site-related contaminants. Therefore, it is unlikely humans have been exposed to groundwater contamination. If the migration of contaminated groundwater is not prevented, contaminants from the site could in the future migrate into residential wells.

Analytical results of private well samples did find one unused industrial supply well (PW-07) contaminated with lead above comparison values. It is unlikely that this lead contamination is related to the ACS NPL site because lead was not detected in groundwater at or near the NPL site and the analyses of a sample from a upgradient-private well just south of PW-07 also did not find lead.

**Surface Water Pathway**

As previously discussed, the upper aquifer discharges into the local marshes, ditches, and creek. In addition, surface water runoff from the NPL site and leachate from the Griffith Municipal Landfill drain into these same bodies of water. Analytical results of surface-water and sediment samples taken from the marshes and ditches on site found site-related contaminants (lead and benzene) above comparison values. These contaminants probably are the result of migration of contaminated groundwater, surface water runoff, and leachate. It is unlikely that human would come in contact with the contaminants on site because access is restricted. The level of contamination steadily decreases with distance from the sources of contamination and is at or below background levels before surface water exits the NPL site boundaries. Therefore, it is unlikely that off-site fish or wildlife would have bioaccumulated site-related contaminants.

**Waste Material and Soil**

Analytical results of soil and waste samples taken at ACS NPL site indicate soil contamination above comparison values at the On-Site Containment, Still Bottoms, Treatment Lagoon #1, Off-Site Containment, and Kapica/Pazmey areas. The contamination at the On-Site Containment, Still Bottoms, Treatment Lagoon #1, and Off-Site Containment areas is

located several feet below the surface. Therefore, human contact with this soil contamination is unlikely except during excavation of this soil. However, these areas of contamination will continue to contribute to the groundwater contamination unless the site is remediated.

The Kapica/Pazmey area subsurface soil contains elevated concentrations of PCBs and metals. Some of these contaminants may be in the surface soils (0-3 inches) because drum rinse water and liquid waste was reportedly discharged directly onto the ground. Wind erosion, human activities (truck movement), and surface water runoff could transport these contaminants off site. Surface soil sampling is needed to confirm whether there is surface soil contamination at levels of public health concern.

**Air**

Although no analytical air monitoring was conducted on site, it is unlikely that significant amounts of NPL site-related contaminants are being released into the air because most of the volatile contaminants (e.g., benzene) are located several feet below the soil surface. Routine air monitoring with hand held instruments (e.g., organic vapor analyzer) did not detect air contamination except when the subsurface soils were excavated.

One possible environmental pathway that has not been investigated is the possible generation and migration of methane gas at the Griffith Municipal Landfill. As solid waste material decomposes methane is generated. Because it is reported that waste material from ACS Inc. and Kapica Drum, Inc. was disposed of in the Griffith Municipal Landfill, it is likely that some hazardous substances are in the landfill. Therefore, methane along with any volatile hazardous substances (e.g., benzene) can travel through the unsaturated soil, above the groundwater, into nearby buildings. Landfill gas analysis should be conducted to evaluate this possible environmental pathway. The landfill gas monitoring should be a part of an overall environmental monitoring and control program for the landfill (e.g., groundwater monitoring and control of contaminant migration).

**B. HUMAN EXPOSURE PATHWAYS**

On the basis of the environmental pathways evaluation, there does not appear to be any current or past human exposures to ACS NPL site-related contaminants at levels of public health concern.

Groundwater monitoring data clearly indicate that no site-related contaminants have migrated to potable water wells (e.g., residential wells). However, in the future contaminated groundwater could enter local residential wells and result in chronic exposure to site-related contaminants at levels of public health concern. The contaminants most likely to migrate into local residential wells are benzene, trichloroethene, and tetrachloroethene. These contaminants are the primary constituents of the groundwater contaminant plume which has

migrated off site.

Most of the soil contamination (On-Site Containment, Still Bottoms, Treatment Lagoon #1, and Off-Site Containment areas) is located under several feet of clean soil which would prevent human exposure except when the soil is excavated. If the subsurface soil contamination is excavated, humans could potentially ingest, inhale, or have skin contact with the soil contamination. However, standard dust control and personal protective procedures should prevent this type of human exposure.

Some surface soil PCB and heavy metal (lead, barium, and cadmium) contamination may be at the Kapica/Pazmey area. If surface soil contamination is at the Kapica/Pazmey area, humans could potentially ingest, inhale, or have skin contact with those contaminants. The Kapica/Pazmey area is not visited very often except to move the stored boats and cars. Therefore, the possible human exposure is likely not to be significant because the visits will be of short duration. Surface soil sampling needs to be conducted before this pathway can be evaluated further.

Analysis of surface water and sediments off-site did not find any contamination above background or levels of public health concern. It is unlikely that humans would ingest on-site fish or wildlife which may have bioaccumulated the lead or other site-related contaminants because no fishing or hunting is conducted on site.

## PUBLIC HEALTH IMPLICATIONS

### A. TOXICOLOGICAL EVALUATION

Although many contaminants were detected at the ACS NPL site at levels of public health concern, available information indicates there are no completed human exposure pathways. However, if future migration of these contaminants continues to occur humans could be exposed to groundwater contamination through ingestion, skin contact, or even inhalation. The groundwater contaminants most likely to migrate into local residential wells are benzene, trichloroethene, and tetrachloroethene. Therefore, the toxicological implications of these three compounds will be discussed below. Because these three compounds have similar toxicologies, they will be discussed together.

In addition, surface soil contamination may be at the Kapica/Pazmey area (on-site). If there is surface soil contamination, humans could potentially ingest, inhale, or have skin contact with the PCB and heavy metal (lead, barium, and cadmium) contaminants. The toxicological implications of these compounds will also be discussed below.

#### Benzene, Trichloroethene, and Tetrachloroethene

Studies of workers indicate that benzene, trichloroethene, and tetrachloroethene effects are dependent on the amount and duration of

exposure. Inhalation and skin contact are the routes of exposure for most of these investigations. Exposure to 10 ppm of benzene, 50 ppm of trichloroethene or 50 ppm tetrachloroethene in the air cause irritation of eye, nose, and throat. As an individual's exposure increases, there are central nervous system effects such as headaches, dizziness, poor coordination, and loss of memory. There can also be skin irritation, nausea, vomiting, and diarrhea. Trichloroethene can also cause loss of feeling and/or pain in the hands or feet (2,3,4).

Exposure to high levels of these chemicals in the air can damage the lungs, liver, and kidneys. These organs can also be affected by chronic exposure to somewhat lower amounts. Long-term exposure of animals to trichloroethene appear to affect the immune system. Short-term exposure to benzene affects the immune system of animals. An effect on the immune system of humans or animals has not been identified for tetrachloroethene (2,3,4).

All these chemicals have been evaluated for their ability to cause cancer. Benzene is considered to be a human carcinogen. The studies of human exposures to trichloroethene and tetrachloroethene are not considered adequate to prove or disprove an association. The results of animal studies indicate tetrachloroethene could possibly cause cancer in humans. The studies of trichloroethene in animals are inadequate to make conclusions about its ability to cause cancer (2,3,4).

Evaluations have been done on the ability of these chemicals to affect the reproductive process or the fetus (i.e., cause birth defects). Testing of animals indicate high doses of benzene, trichloroethene, and tetrachloroethene can cause both reproductive effects and birth defects. However, these studies are inconclusive whether these chemicals cause reproductive effects and birth defects in humans (2,3,4).

The way benzene, trichloroethene, and tetrachloroethene enter the human body can influence the health effects experienced. When inhaled or ingested a high percentage of these chemicals move into the bloodstream. Therefore, the health effects of ingesting these chemicals may be similar to inhaling equivalent concentrations. The health effects of skin contact are probably not similar to inhaling or ingesting because less of the chemicals are able to move from the skin into the bloodstream (2,3,4).

The occurrence of health effects is affected by the length of time it takes the body to process (metabolize) and eliminate a chemical and how much of the chemical is stored. Slow metabolizing and/or long-term storage results in a steady decrease in the amount needed to cause health effects as exposure continues. Benzene, trichloroethene, and tetrachloroethene are eliminated from the body in a few days to a week. Little or none of these chemicals are stored in the human body (2,3,4).

**PCBs**

PCBs are a group of chemicals which were manufactured until 1977 for use

as coolants and lubricants in transformers and other electrical equipment. PCBs can still be found in older electrical equipment and there is extensive low level PCB contamination of the environment (5).

Studies of human exposures to PCBs indicate these chemicals can cause skin irritation and liver effects. These studies did not identify the relationship of dose to effect. There is limited evidence from human studies that PCBs can cause cancer and reproductive and birth defects (5).

PCBs can enter the body through inhalation, ingestion, or contact with the skin. The rate which PCBs can enter the body through these three routes has not been clearly identified yet (5).

PCBs are metabolized and eliminated from the body in days to years. They can be stored in the body for years. The rate of elimination and amount stored is dependent on the specific type of PCBs (5).

**Lead**

Exposure to lead causes a wide range of effects. Short-term exposures above 0.05 ppm in air affect the central nervous system (headaches, dizziness, etc.) and gastrointestinal tract (nausea, diarrhea, and vomiting). Higher amounts can affect the production of blood, kidney and heart functions, and behavior. Long-term exposure of adults to lead above 0.05 ppm in water has similar effects as just mentioned, plus causes blood pressure to rise. Lead is also strongly linked with decreases in IQ, mood disorders, memory loss, poor coordination, and decreased function of the thyroid and adrenal glands. Children are especially sensitive to lead with effects observed at half the concentration in adults for the same effects (6).

Lead is considered a possible human carcinogen based on studies in experimental animals. The results of investigations of an association between lead exposure and cancer in workers are contradictory (6).

Lead can affect both the reproductive process and the development of the fetus. Effects include reduced production of sperm, premature birth, low birth weight, and after birth learning disabilities (6).

Lead enters the blood much easier through inhalation and ingestion than through skin contact. Lead is eliminated from the body slowly, with much of it being stored in the bones. Because lead remains in the body, the amount needed to cause an effect decreases as length of exposure increases (6).

**Barium**

There is not much information on the health effects of barium on humans. Studies of a small number of people who ingest large doses of barium reveal effects on the respiratory, cardiovascular, and central nervous systems; and to the liver, kidney, and spleen. However, lower

concentrations of barium are often used in making x-rays of the stomach or intestine and have never been found to be harmful. There are no valid data on whether barium causes cancer, birth, or reproductive effects in humans or animals (7).

Barium enters the blood much easier through inhalation than through ingestion. It is very difficult for barium to enter the body through skin contact. Barium is eliminated from the body in one to two weeks. Whatever remains is stored in the bones. It is not known whether the stored barium can cause health effects (7).

**Cadmium**

Exposure to cadmium can cause a variety of health effects in humans. Ingestion of 0.1 milligrams of cadmium per kilogram of body weight per day and above can cause nausea, vomiting, and diarrhea. Inhalation of greater than 0.1 ppm of cadmium in air causes irritation of the respiratory tract. Long-term exposure to this metal can damage the kidney and lung. There is limited evidence from human studies that cadmium causes lung cancer, but there is no evidence that cadmium causes birth defects or reproductive problems in humans (8).

Data from animal studies indicate cadmium can cause cancer, reproductive and birth defects, and liver damage. The animal studies also indicate cadmium affects the immune and central nervous systems (8).

Cadmium enters the blood much easier through inhalation than through ingestion. It is very difficult for cadmium to enter the body through skin contact. Cadmium is eliminated from the body slowly, with much of it being stored in the bones. Because cadmium remains in the body, the amount needed to cause an effect decreases as length of exposure increases (8).

## B. Health Outcome Data Evaluation

The health concern of the individuals who petitioned ATSDR (see Community Health Concerns section) is a high frequency of cancer occurring within an 8-block area north of the ACS NPL site. The types of cancers reported are breast, brain, uterus, and leukemia.

As indicated in the Human Exposure Pathways section, there is no documentation indicating human exposures to ACS NPL site-specific contaminants are occurring or have occurred in the past. Therefore, it is unlikely that the human health outcomes reported by the petitioners are occurring as a result of the ACS NPL site.

Cancer of the breast or uterus has not been previously shown to be associated with environmental agents (9). Cancer of the lung, brain, and colon-rectum, and leukemia have been associated with environmental agents. Two of the most important environmental factors associated with cancer are tobacco use (up to 35% of all cancer deaths) and diet (up to 35% of all cancer deaths). Some hazardous substances have been

associated with some cancer (for example, occupational asbestos exposure with lung cancer, occupational benzene exposure with leukemia, and residential radon exposure with lung cancer) (10).

In an attempt to initially address this community health concern, the Indiana State Board of Health provided ATSDR with 1987-1989 cancer incidence data for Griffith from the Indiana Cancer Registry and 1970-1979 site-specific cancer mortality rates by race and gender for the United States, Indiana, and Lake County. In addition, ATSDR reviewed 1950-1979 cancer mortality data for Lake County from the Riggans Cancer Mortality database.

Review of the incidence data showed percentages of site-specific cancers for Griffith (population of 17,916 - 1990 U.S. Census) to be comparable to the United States experience. The four leading types of cancer were lung, colon-rectum, cervix, and breast. Review of the mortality rates showed more deaths than expected in Lake County for all cancer sites combined when compared to the State of Indiana. These data were limited by their inability to identify cases occurring in the area of the 8 blocks which are of concern to the petitioners. Information about the numbers of specific cancers and the characteristics of the affected persons are not available.

To better address additional health concerns, a health statistics review could be conducted in the future when the Indiana Cancer Registry will have additional years of data and the ability to identify cases residing in the 8-block area. A health statistics review could better quantify and characterize the specific cancer cases of concern to the petitioners and be beneficial in targeting any public health education activities for the community.

**C. Community Health Concerns Evaluation**

During the April 1990 site visit, ATSDR obtained community health concerns from the individuals who petitioned the Agency. The individuals had two general concerns.

1. **The petitioners believe there is high frequency of breast, brain, uterus, lung, and leukemia cancer occurring within the 8-block area north of the ACS NPL site.**

As indicated in the Human Exposure Pathways and Health Outcome Data Evaluation sections, there is no documentation indicating human exposure to ACS NPL site-related contaminants. Therefore, it is unlikely that the human health outcomes reported by the petitioners are occurring as the result of the ACS NPL site.

2. **The petitioners are concerned that the oil and solvent discharge from the Griffith Airport may have contaminated their residential wells.**

As a result of information provided by the Indiana State Board of

Health, EPA, and ATSDR, the Indiana Department of Environmental Management (IDEM) conducted a Preliminary Assessment in February 1991 and a Site Investigation in October 1991 on the Griffith Airport oil and solvent discharge. IDEM concluded no further remedial action for the Griffith Airport is warrented.

## CONCLUSIONS

1. On the basis of the available information, ATSDR concludes the American Chemical Services NPL site is an indeterminate public health hazard since ATSDR needs additional information on surface soil in the Kapica\Pazmey area to determine the health impact in the event individuals come in contact with potentially contaminated on-site surface soil.

2. ATSDR found no evidence of current or past exposure to site-related contaminants by residents. However, as long as waste material and contaminated soil have not been remediated, the contaminants can migrate into the groundwater. In the future it is possible that contamination in groundwater could migrate to residential wells. The site may become a public health hazard in the future if residents are chronically exposed to contaminants at concentrations currently detected in the off-site monitoring wells.

3. One unused industrial supply well was found to contain lead at levels of public health concern, 0.0417 mg/L. It is unlikely this lead contamination is related to the American Chemical Services NPL site because lead was not detected in groundwater at or near the NPL site and analyses of a sample from an upgradient-private well just south of the contaminated private well did not find lead.

4. Data inadequacies include the following:

   a. ATSDR concludes that additional surface soil sampling (0 to 3 inches) should be conducted at the Kapica/Pazmey area. This sampling is needed to better characterize the extent of surface soil contamination.

   b. The extent of environmental contamination at the Griffith Municipal Landfill has not been totally characterized. Soil gas analysis should be conducted to evaluate the extent of landfill gas generation and migration.

   c. The cancer incidence data and cancer mortality data are limited by the inability to identify cases occurring in the area of blocks which are of concern to the petitioners. In addition, the numbers of specific cancers and characteristics of the affected persons are not available.

## RECOMMENDATIONS

### Cease/Reduce Exposure Recommendations

1. Workers conducting remedial activities should be protected from exposure to site contaminants by following appropriate Occupational Safety and Health Administration (OSHA) standards and National Institute of Occupational Safety and Health (NIOSH) recommendations.

2. Dust and vapor control measures should be implemented to prevent on-site and off-site exposure to site-related contaminants during excavation of waste material and contaminated soil.

### Site Characterization Recommendations

1. Quarterly monitoring for site-related contaminants should be conducted at residential wells downgradient of the site. Appropriate procedures should be employed to prevent human exposure to off-site migration of groundwater contamination.

2. Surface soil (0-3 inches) sampling should be conducted to better characterize the extent of surface soil contamination at the Kapica/Pazmey area. Appropriate procedures should be employed to prevent exposure to potential surface soil contamination at the Kapica/Pazmey area.

3. The extent of landfill gas generation and migration from the Griffith Municipal Landfill should determined. Appropriate procedures should be employed to prevent human exposure to landfill gasses. The landfill gas monitoring should be a part of an overall environmental monitoring and control program for the landfill (e.g., groundwater monitoring and control of contaminant migration).

### Health Follow-Up Recommendations

1. When adequate cancer incidence data from the Indiana Cancer Registry become available an in-depth health statistics review should be conducted to determine whether there is a high frequency of cancer occurring within the 8-block area north identified by the local citizens.

2. When indicated by public health needs, the evaluation of additional relevant environmental data, health outcome data, and community health concerns, if available, is recommended.

### Health Activities Recommendation Panel (HARP) Recommendations

The American Chemical Services NPL site, Griffith, Lake County, Indiana, has been evaluated by the ATSDR Health Activities Recommendations Panel to determine what future health-related activities ATSDR should conduct

at this site. Although there is no documentation indicating human exposure to site-related contaminants, there are public concerns which should be addressed. HARP recommends the following:

1. ATSDR provide public health education during meetings with the petitioners and the general public.

**Public Health Actions**

In response to community concerns, and based on the health assessors' and HARP conclusions and recommendations, the following actions either have been or will be performed.

ATSDR in cooperation with the Indiana State Board of Health will conduct the following public health actions.

1. Discuss the findings of the public health assessment and community health concerns with the petitioners.

2. Evaluate additional environmental data, health outcome data, and community health concerns when indicated by public health need.

The EPA in cooperation with the IDEM will conduct the following actions.

1. EPA will ensure OSHA standards and NIOSH recommendations are used during site activities to protected workers from exposure to site contaminants.

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6. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Lead. Atlanta: ATSDR, 1988.

7. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Barium. Atlanta: ATSDR, 1991.

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# APPENDICES

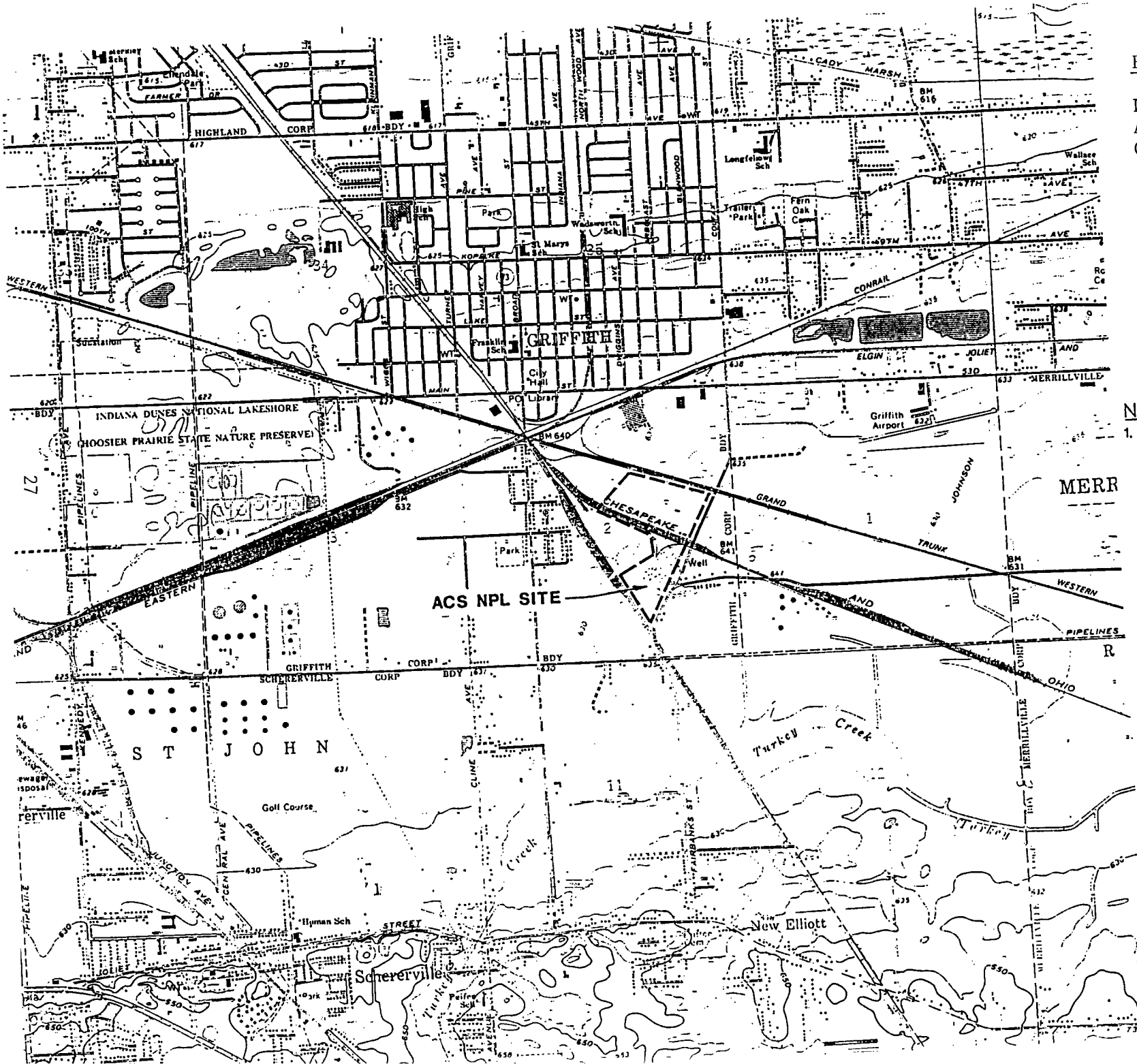



FIGURE I.

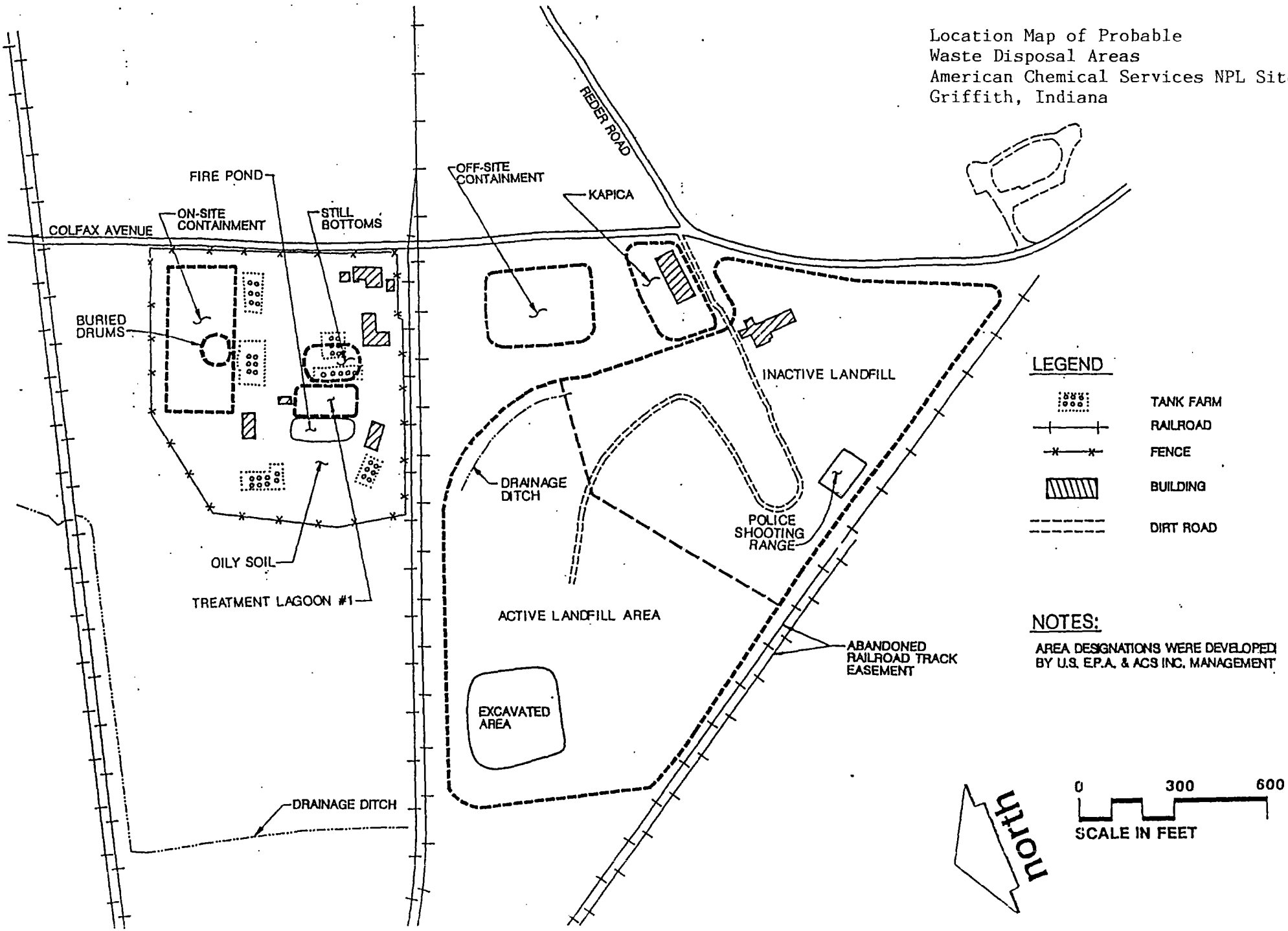
Location Map for the
American Services NPL Site
Griffith, Indiana

NOTES

1. BASE MAP DEVELOPED FROM HIGHLAND & ST. JOHN, INDIANA 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAPS DATED 1968 AND 1962, RESPECTIVELY, PHOTOREVISED 1980.

FIGURE II.

Location Map of Probable
Waste Disposal Areas
American Chemical Services NPL Site
Griffith, Indiana



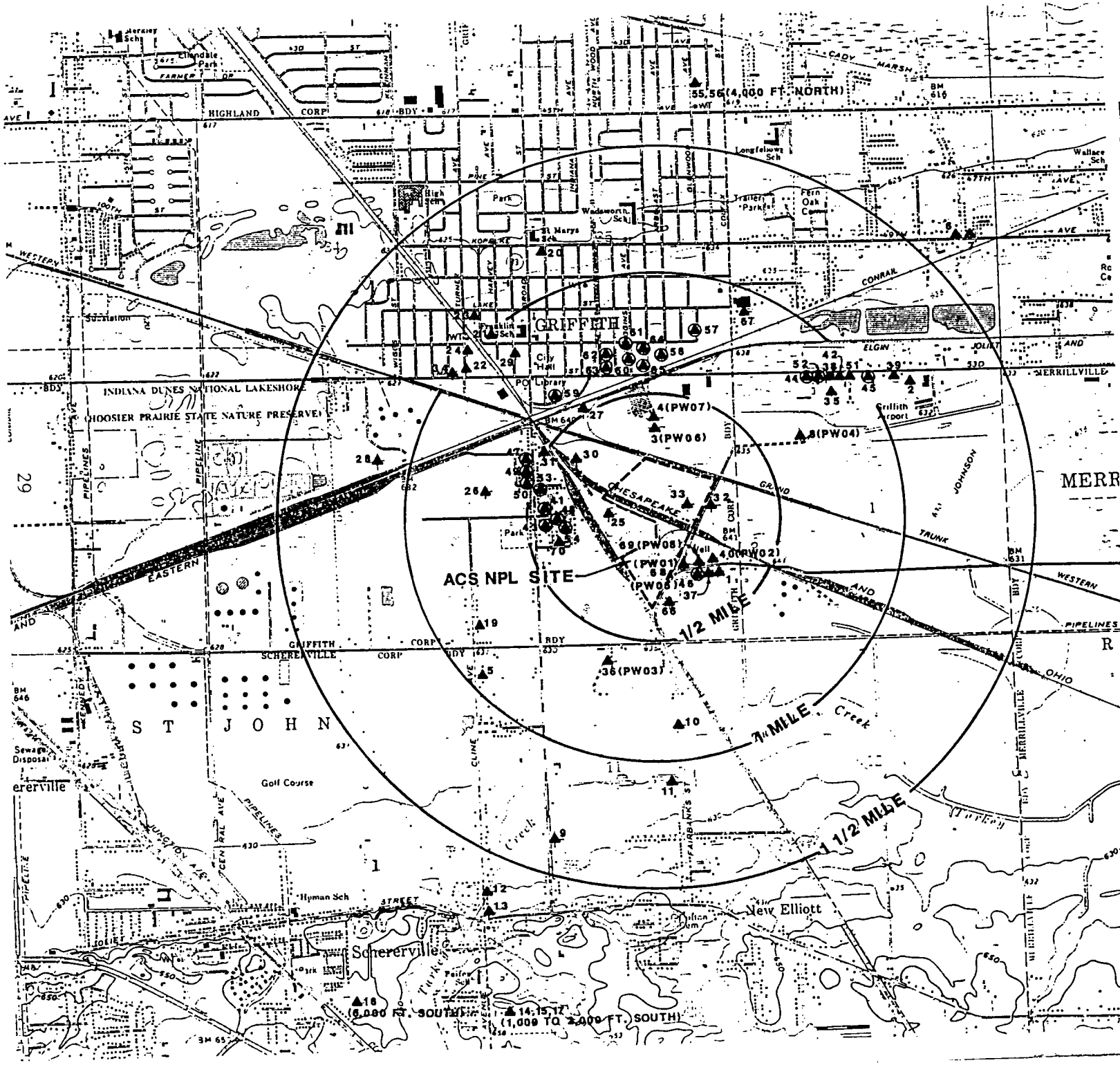



FIGURE III.

Location Map of Residential Wells near the American Chemical Services NPL Site Griffith, Indiana

LEGEND

- UPPER AQUIFER PRIVATE WELL LOCATION
- LOWER AQUIFER PRIVATE WELL LOCATION
- (PW01) PRIVATE WELL SAMPLING LOCATION

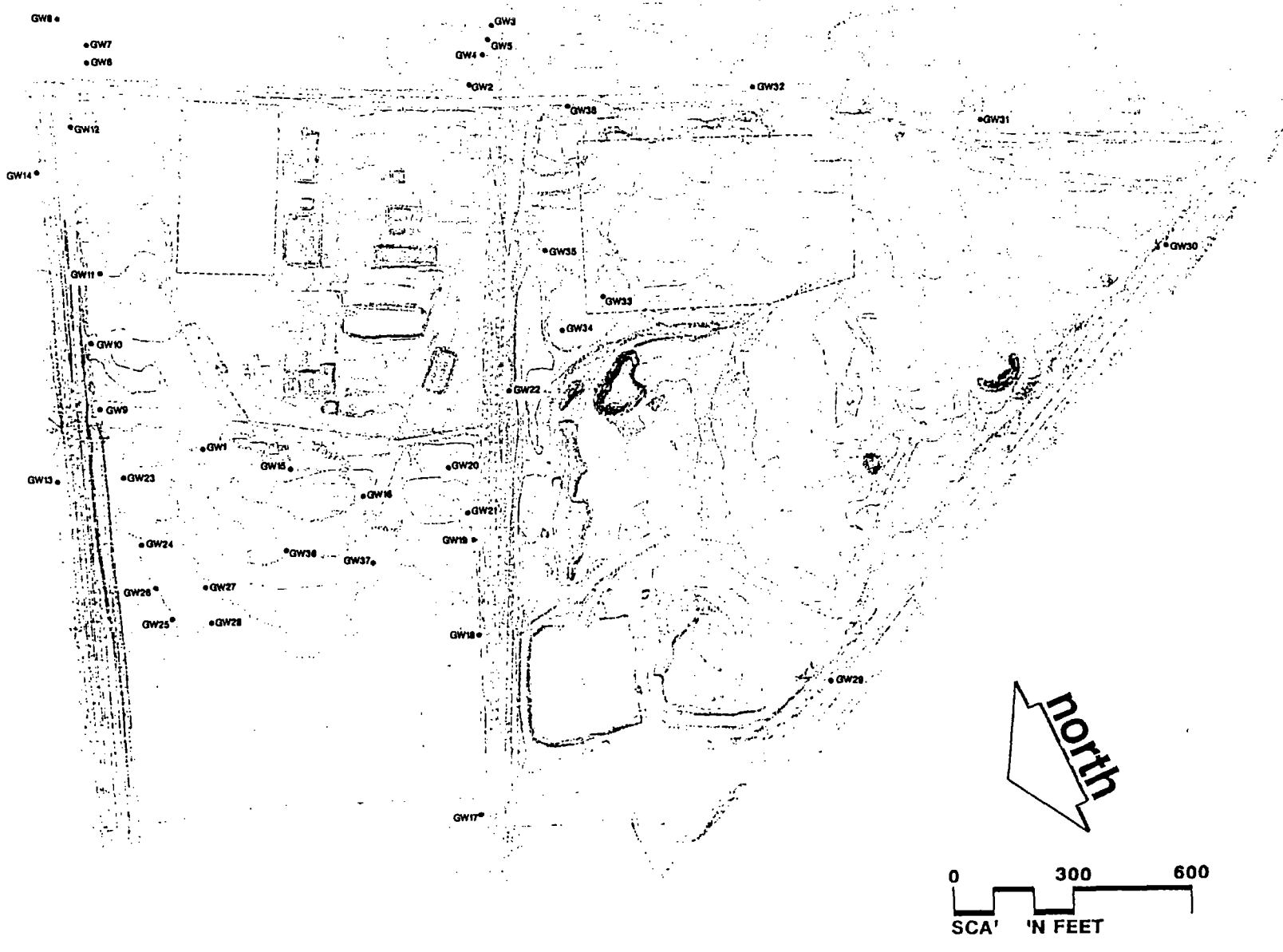
NOTES

1. BASE MAP DEVELOPED FROM HIGHLAND & ST. JOHN, INDIANA 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAPS DATED 1968 AND 1962 RESPECTIVELY, PHOTOREVISED 1980.
2. PRIVATE WELL DATA WAS OBTAINED FROM THE INDIANA DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATER WELL LOGS, OR A USEPA SURVEY, OR A WARZYN DOOR TO DOOR SURVEY.
3. SUMMARY OF PRIVATE WELLS LOCATED ON THIS MAP IS INCLUDED IN TABLE 2-6.
4. INDIANA DEPARTMENT OF NATURAL RESOURCES WELL LOGS ARE INCLUDED IN APPENDIX L.
5. PRIVATE WELL SAMPLING WAS CONDUCTED BY WARZYN ENGINEERING INC. ON JUNE 13 & 14, 1990.

FIGURE IV

Location Map of the Extent of Groundwater Contamination American Chemical Services NPL Site

Griffith, Indiana




LEGEND

| | |
|---|---|
| ---- | GEOPHYSICS INVESTIGATION AREA |
| ● GW1 | GROUNDWATER SAMPLING POINT LOCATION & NUMBER |

NOTES

1. INITIAL BASE MAP WAS DEVELOPED FOR CAMP DRESSER & MCKEE INC ON NOVEMBER 8, 1988. MAP HAS BEEN UPDATED FROM AN AERIAL PHOTOGRAPH OF THE SITE FLOWN ON NOVEMBER 3, 1989 BY GEONEX CHICAGO AERIAL SURVEY, INC. THE BASE MAP WAS UPDATED BASED ON THE AERIAL PHOTOGRAPH BY GEONEX.
2. VERTICAL DATUM IS USGS DATUM. CONTOUR INTERVAL IS (1) ONE FOOT.
3. ALL GROUNDWATER SAMPLE POINTS WERE PART OF A SHALLOW GROUNDWATER INVESTIGATION PERFORMED BY TRACER RESEARCH CORPORATION UNDER SUPERVISION BY WARZYN ENGINEERING INC. (MARCH 28, 1990 THROUGH APRIL 2, 1990).
4. GROUNDWATER WAS COLLECTED BY DRIVING HOLLOW PROBES WITH DETACHABLE DRIVE POINTS TO A SPECIFIED DEPTH BELOW THE WATER TABLE. A GROUNDWATER SAMPLE WAS COLLECTED IN A 40 ML VOC VIAL. THE HEADSPACE OF EACH SAMPLE WAS ANALYZED FOR BENZENE, ETHYL BENZENE, TOLUENE, XYLENES, AND TOTAL PETROLEUM HYDROCARBONS USING A POTABLE VARIAN 3300 (FID) GAS CHROMATOGRAPH. ALL SAMPLE AND ANALYTICAL EQUIPMENT WAS CONTAINED IN A 4-WHEEL DRIVE TRACER VAN.
5. GROUNDWATER SAMPLE POINT LOCATIONS ARE APPROXIMATE.
6. REPORT OF FINDINGS IS COMPILED IN APPENDIX J.